Tulsa Winch

RUFNEK 60/100

SERVICE MANUAL

SEL-0009
REV-3

MODEL CODE

RN100 L O 2 1

BASIC MODEL
RN60/RN100

LEFT/RIGHT MOUNT

SPOOL OVER/UNDER DRUM

MOTOR TYPE
1. SINGLE SPEED GEAR MOTOR
2. TWO SPEED GEAR MOTOR
3. SINGLE SPEED GEROLER
4. TWO SPEED GEROLER
5. PISTON
6. VANE
X. NO MOTOR

MANUAL TWO SPEED GEARBOX
1. WITHOUT
2. WITH

!WARNING!

FAILURE TO HEED THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

1. Tulsa Winches are not to be used to lift, hoist, or move people. If your task involves lifting or moving people, you MUST use the proper equipment, not this winch.
2. Cable anchors on Tulsa Winches are not designed to hold the rated load of the winch. You must keep at least five (5) wraps of cable on the drum to insure that the cable doesn't come loose.
3. Stay clear of the suspended loads and of cable under tension. A broken cable or dropped load can cause serious injury or death.
4. Make sure that all equipment, including the winch and cable, is maintained properly.
5. Avoid shock loads. This type of load imposes a strain on the winch many times the actual weight of the load and can cause failure of the cable or of the winch.
6. Winch operators must be trained in the proper, safe operation of the winch.
7. Do not use EP type gear lubes in the brake section of this winch. EP lubes may prevent the clutch from locking up, causing a load to fall, and resulting in property damage, personal injury, or death.
8. The hydraulic system should use only high quality hydraulic oils from reputable suppliers. These oils should contain additives to prevent foaming and oxidation in the system. All winch hydraulic systems should be equipped with a return line filter capable of filtering 10-micron particles from the system.

INTRODUCTION AND THEORY OF OPERATION

The Rufnek series planetary winch is designed to use a high-speed gear motor, driving through a multiple disc brake, through three planet sets to the cable drum.

The multiple disc brake is spring applied and hydraulically released through a port in the brake housing. During inhaul, the brake is not released since the load is driven through the one-way cam clutch, bypassing the brake. When the load comes to a stop, the cam clutch locks up and the load is prevented from moving by the brake.

The brake and brake valve receives its signal any time the winch is in pay out. With the brake fully open at about 340 PSI the brake valve will open and dynamically control the lowering of the load.

MAINTENANCE

Tulsa Rufnek series planetary winches, like any other piece of machinery, need to be periodically serviced and well maintained to insure proper operation.

Good maintenance consists of four steps.

1. A daily inspection to insure that there are no oil leaks present and that all mounting bolts and other fasteners are tight, and that the wire rope is in good condition.
2. Changing the oil in both the gearbox and the brake section. *(Severity of use will determine the need for oil changes but it should be checked at a minimum of every 500 hours. Factors such as extremely dirty conditions or widely varying temperature changes may dictate even more frequent servicing)*.
3. Lubing drum bushings and sliding clutch with grease thru grease fittings located on drum barrel and clutch.
4. Complete teardowns and component inspections. *(Again, severity and frequency of use will determine how often this should be done)*. If the equipment that this winch is mounted to is subject to standards for this type of inspection, then those standards must be followed. If oil changes reveal significant metallic particles then a teardown and inspection must be made to determine the source of wear.

Tulsa Rufnek series of winches are shipped from the factory with Mobilube SHC SAE 75W-90 gear lube in the gearbox and automatic transmission fluid in the brake section. This oil should be satisfactory for operation in ambient temperatures from -40°F to +110°F. If your work calls for operation in temperatures outside this range, contact Tulsa Winch for recommendations.

Gearbox oil is drained by removing the fill plug (item 39) located at the top of the gear housing (item 10). Remove the drain plug (item 31) located at the bottom center of the gear housing. Examine the used oil for signs of significant metal deposits and then dispose of it in a proper manner. Reinstall the drain plug and fill the gearbox with the proper amount of new Mobilube SHC SAE 75W-90 gear lube through the fill hole. Replace the fill plug. Make sure the breather (item 93) is operational and replace if necessary.

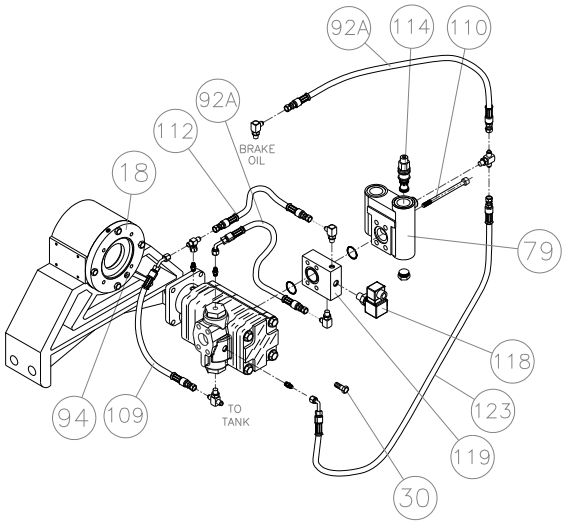
Drain the brake section by removing the drain plug and breather in the brake cover (item 18). Inspect the oil for signs of metallic particles and/or burning and re-install the drain plug. Fill with one half to one pint of automatic transmission fluid, or hydraulic oil and replace the breather.

OIL CAPACITIES

	RN60	RN100
GEAR LUBE	8 qts.	10 qts.
BRAKE OIL	1/2-1 pt.	1/2-1 pt.

GENERAL DISASSEMBLY

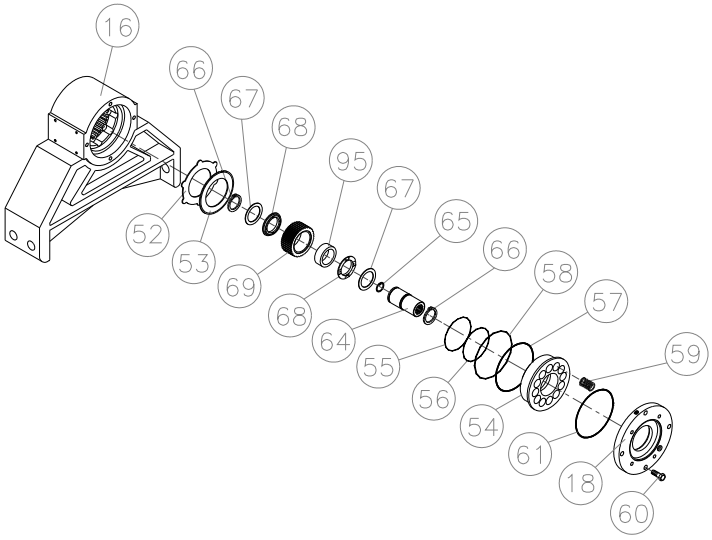
A. MOTOR DISASSEMBLY



1. Drain the oil from the brake assembly by removing the plug (94) from brake cover (18).
2. Remove hoses (92A, 109 & 112).
3. Remove the counterbalance block (79); manifold block (119) and switch (118) from the motor by removing the four capscrews (110).
4. Remove the counterbalance valve (114) from the counterbalance block (79) and inspect the metering hole to make sure it is not obstructed. Also, inspect the o-rings to insure that they are not flat or cut. Replace if necessary.
5. Motors and counterbalance valves are not serviceable in the field. Return them to an authorized dealer for service.

B. BRAKE SECTION DISASSEMBLY

1. Evenly remove the four capscrews (60) that hold the brake cover in place. Spring pressure will raise the cover up as the capscrews are loosened. Carefully remove the cover (18) from the brake housing (16). Inspect the o-ring (61) for damage.
2. Remove the springs (59) from the piston (54) and check the free height. Each spring should measure at least 1.200 inches with no force on them.
3. Remove the piston (54) by installing two pieces of 3/8”-16NC all thread into the two holes in the top of the piston and run in evenly until the piston is clear of the housing. An alternate way of removing the piston is to use a portable hydraulic power unit or air to gently pressurize the brake cavity to remove the piston from the brake housing (16).
4. Inspect o-rings (55, 57) and back up rings (56, 58) on the piston. Replace if necessary. Grasp the brake driver/clutch assembly (assembled items 64, 65, 66, 67, 68, 69, 95) and remove it from the brake housing.
5. Remove the stator plates (52) and friction discs (53) from the brake housing and check them for excessive wear. Replace if necessary. Be sure to check the top stator plate for scoring caused by the removal of the piston and polish if necessary. Friction discs should measure no less than .055-in. thickness and stator plates should measure no less than .068-in thickness.
6. To disassemble the brake driver/clutch assembly, remove the retaining ring (66) from either end of the driver. Then remove the race (67) and bushing (68). Slide the brake driver off the drive coupling. *(Note: Notice the direction of lock-up on the clutch for re-assembly).* Inspect the driver coupling and brake driver for wear. Replace if necessary. If the drum bushings or seals need to be replaced, see the drum section of this manual before re-assembly of the brake.



C. DRUM SECTION DISASSEMBLY

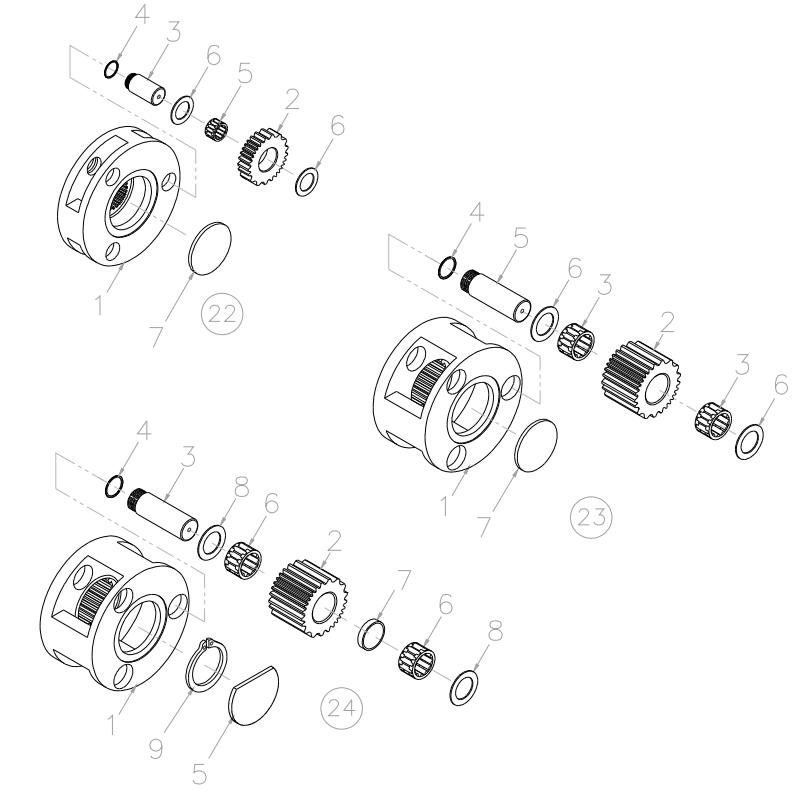
1. To remove the drum, first disconnect the cable from the u-bolt (43) and lay aside. If removing the drum from the motor end with the motor and brake disassembled, first remove the eight capscrews (51), eight roll pins (103), and air cylinders covers (96,97) on the air cylinders (17 & 125). *Note: you may need to remove the air lines. Mark them for re-assembly.*
2. You will need to support the weight of the drum with a hoist. Remove the four capscrews (70) and the nuts and washers (71, 72) on the bottom of the brake housing, (16). At this time you will need to remove two capscrews (91), nut and washers (85, 86) from the frames (73 or 74). Do not remove air cylinder (76) yet. Disconnect the air line from the backside of the brake housing (16) that goes to the band brake cylinder. If a complete tear down is not necessary, make sure the output shaft (20) or input shaft (21) does not move during removal of the drum. With help from a hoist or another person, slide the whole brake housing out from the drum until you are free of everything. You can now remove the brake band assembly (77). Note which frame the mounting bolts are on for re-assembly. Inspect and replace any worn parts of this assembly. Remove the outer thrust collar (131) by removing two set screws (130).
3. Remove the thrust ring (128) and clutch plate (15) by removing six capscrews (129). Remove the sliding clutch (13), coupler (12), keys (47) and the inner thrust collar (46). Remove the drum using a hoist. Inspect the bushings (19) in both ends of the drum. *Note: You may also inspect the bushing and seal (40, 41) that are located in the end of the brake housing.*
4. Inspect or replace the drum clutch (14) at this time by removing six capscrews (45). If you replace the clutch, make sure to torque the capscrews to the specified torque upon re-assembly.

D. GEAR SECTION DISASSEMBLY

1. Drain the oil at the bottom of the gear housing by removing the plug (31).
2. To disassemble the gear section, you must start with the outer cover. Remove the capscrews (30) and cover (3A). *Note: If you have the blocked piston cover assembly, take it off as an assembly and see Service of Blocked Piston Cover Assembly.*
3. Inspect the o-ring (33), bearing (27), and spacer (127). Remove and inspect the outer thrust washer (34) and replace if necessary.
4. Remove input gear set (22A), the inner thrust washer (34), sun gear (7), and the secondary gear set (23). Remove the thrust washer (37) and inspect for wear. Replace if necessary.
5. Remove the primary housing (9) by removing eight capscrews (35). *Note: The housing is very heavy. Use caution when removing it.*
6. After removing the primary housing, inspect the o-ring (36). Remove the sun gears (8 ,111). Rotate thrust washer ((24-5) or (24-7)) into alignment with snap ring ((24-9) or (24-8)). Remove snap ring from groove on shaft (20). Remove output gear set (24). Remove and inspect the thrust washer (38). Replace if necessary.

E. PLANET SET DISASSEMBLY

1. Remove the retaining rings from the planet pins.
2. Remove the pins from the carrier by carefully tapping them out.
3. Remove the planet gears, thrust washers and bearings from the carriers.
4. Inspect the pins, bearings, and gear bores for evidence of wear and replace if necessary.
5. To re-assemble output gear set first insert snap ring.
6. Next insert thrust plate into carrier of input or output gear set along with gears, bearings and washers.
7. Being careful to line up the planet pins with the thrust washers and bearings. Press the pin into the carrier. If the pins are not lined up properly, the thrust washer can be shattered during the pressing operation.
8. Replace retaining rings



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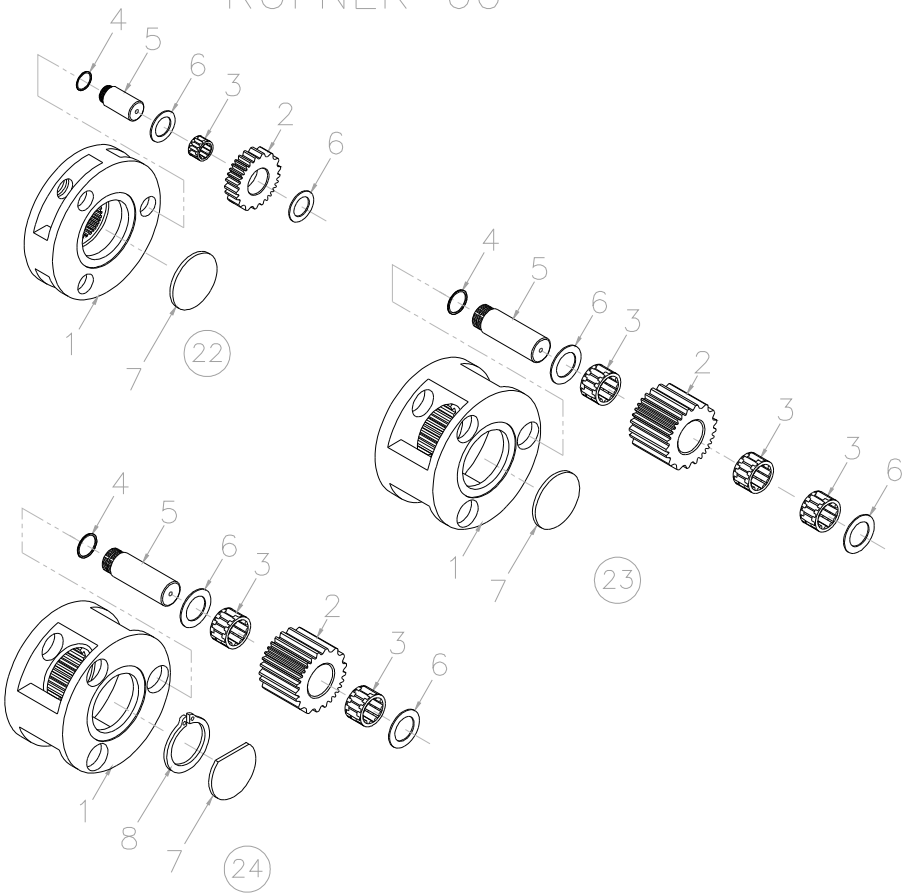

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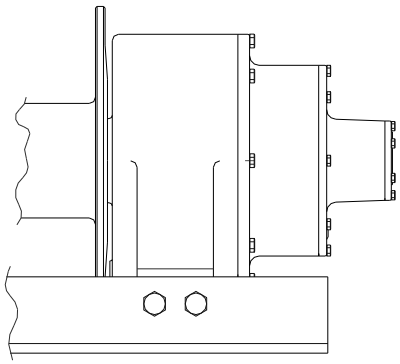
BLOCKED PISTON COVER DISASSEMBLY

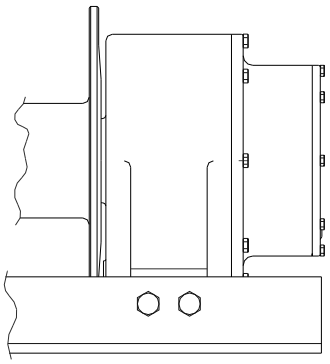
1. Loosen the six capscrews (25B) that secure the outer cover (1B). This cover is spring-loaded so the capscrews (25B) will need to be loosened evenly. The spring (2B) is longer than the capscrews. Use extreme caution!
2. After the capscrews (25B) have been loosened, remove the cover (1B) and inspect the o-ring (26B) and bearing (27). (This is a blocked piston assembly and the piston (4B) is not in use. You may want to leave the piston and spacer (108B) in the housing and bypass inspection.)
3. Remove the thrust washer (75B) and sun gear (6B).

BLOCKED PISTON COVER ASSEMBLY

1. Inspect and replace any worn parts. With the piston (4B) and the spacer (108B) in place, assemble the sun gear (6B), thrust washer (75B), and spring (2B). Install the cover (1B) on top of the spring and align the bolt holes. Apply pressure straight down until you can get all six capscrews (25B) started at least 2-3 threads. Torque all six capscrews to proper specification.



With Blocked Piston Assembly



Without Blocked Piston Assembly

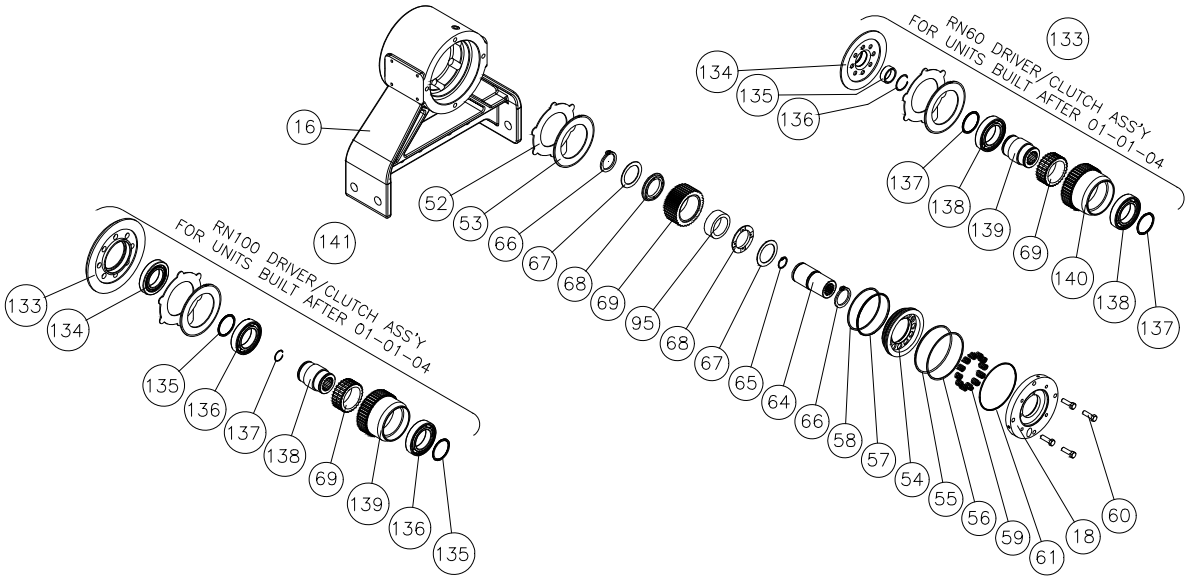
GENERAL ASSEMBLY

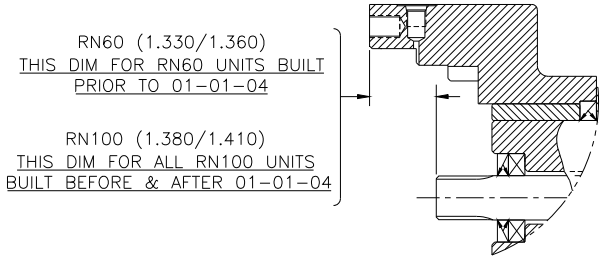
F. GEAR END ASSEMBLY

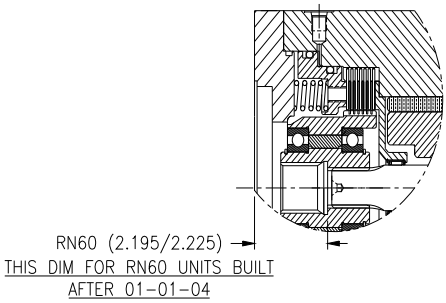
1. Bolt gear-housing (10) loosely into both frames (73, 74).
2. When reassembling use a lot of grease or oil on the areas such as the thrust washer, o-ring and seals. First slide thrust washer (38) onto shaft. Next install the output gear set (24) into the gear housing (10). Rotate the thrust washer ((24-5) or (24-7)) in position to allow installation of the snap ring ((24-8) or 24-9)) into the shaft groove. Push the gear set and shaft back into the housing until it stops against the thrust washer (38). Then install snap ring onto output shaft (20). *(Note: Line up all three planet gears in the output gear set with the gear housing as it starts into the housing).*
3. Install the output sun gear (8, 111), the thrust washer (37), then the secondary gear set (23).
4. Line up the teeth that are on the inside of the primary gear housing (9) with all three of the gears on the secondary gear set. Push the primary gear housing (9) into place making sure not to cut the o-ring (36). Install the eight capscrews (35) and torque them to specification.
5. Install the secondary sun gear (7). Making sure it is against the washer in the secondary gear set.
6. Attach the inner thrust washer (34) to the input gear set (22A). Insert input gear set (22A) making sure it is against the thrust washer (34). Put the outer thrust washer (34) in place and slip the input shaft (21) all the way though the output shaft (20). Let the input shaft stick out on the gear end so that all of the spline is showing. Make sure the correct end is towards the gear end. It will not work if it is backwards.
7. Slip the input sun gear (6A) and race (127) onto the end of the input shaft (21). Push back on the input shaft and sun gear at the same time until the sun gear fits into the inside diameter of the three planet gears on the input gear set. Put the cover (3A) on and secure the eight capscrews (30) making sure the o-rings (33) is not cut.
8. If you have the blocked piston version, after rebuild, install it just as you would the other cover except when you slip the outer input sun gear on the shaft it is locked into the cover assembly. When installing the blocked piston cover assembly rotate it back and forth until the sun gear lines up with the planet gears in the input gear set and then secure the eight capscrews (30) to the proper torque. On the motor end, lightly tap on the input shaft until it seats into the bearing (27) in the cover. Note: In both cover versions assistance may be needed in holding the input shaft while the cover is installed.

G. DRUM SECTION ASSEMBLY

1. After inspecting and replacing the necessary parts, you can reinstall the drum (11). This part is very heavy and you will need the assistance of a hoist. With the weight of the drum supported, install the brake band assembly (77) and reattach the capscrews (91), nut and washers (85 & 86). The brake band air cylinder (76) can be reattached later if not all together.
2. Install the inner thrust collar (46) making sure the half moon slots are lined up with the key slots in the output shaft (20). Tap the three keys (47) into their slots in the output shaft and slide the coupler (12) into place.
3. Install the sliding clutch (13), clutch plate (15), and thrust ring (128) by installing six capscrews (129). Then install the outer thrust collar (131). Again, align the half moon slots with the keys. Holding tightly against keys, lock down the set screws (130).
4. Slide the brake housing (16) into place. The air line from the brake band air cylinder can be attached at this time.
5. Install the four capscrews (70), nuts and washers (71, 72) into the frames (73, 74).
6. Slide the clutch (13) out of gear so you can turn the drum freely and tighten all bolts through the frames to the proper torque specification.
7. Turn the drum to make sure it is not binding.
8. Install the sliding clutch air cylinders (17 and 125) and air cylinder covers (96 & 97) to the brake housing with the four capscrews (51) on each side.
9. Readjust the adjusting nuts (99) on the clutch plate (15). Hook air to the cylinders and apply air both directions. With the clutch fully engaged (air applied) there should be slight movement on the clutch plate in both directions. When adjusted properly tighten the jam nut on the end of the air cylinder to lock in place.







H. BRAKE SECTION ASSEMBLY

1. Measure the distance as shown above. If needed add shims part number 33324 and 994188 inside input driver (64) to achieve above noted dimension. *(Note: For RN60 units built after 01-01-04 measuring and shimming is done after installing the cover (18) as shown above. Refer to Field Service Literature (FSL-0017) for RN45-130 product enhancements to the driver/clutch ass'y*
2. Re-assemble the driver/clutch assembly making sure the clutch is installed properly and checking to make sure the cam clutch is free turning in the pay in direction. Install the driver/clutch assembly onto input shaft (21A).
3. Install the stator plates (52) and friction discs (53) starting with a stator plate and alternating between friction discs and stator plates until eight stator plates and seven friction discs are used. Note: Soak friction discs in hydraulic oil before installation
4. Coat the piston O.D. with oil or grease and install the piston into the brake housing by gently tapping it down until it is seated making sure not to damage the o-rings or back-up rings.
5. stall the springs into the spring pockets. If working in a horizontal position, coat the bottom of each spring with chassis lube to keep it in position.
6. Coat the o-ring (61) with oil or grease and install it into the groove on the brake cover (18).
7. Install the cover onto the brake housing using the capscrews (60). Then draw it down evenly, alternating between opposite hex bolts. Make sure that the cover is aligned properly with the brake housing to orient the motor as it should be.
8. Check the brake release with a portable hydraulic pump. Full release should be obtained at 340psi, plus or minus 20psi. Also, check the brake for proper operation by applying 280psi to the brake port and adapting a torque wrench to the input shaft. The torque in the payout should be 95 to 115 ft-lbs.
9. Install the motor (63) and secure with the four capscrews (30). Tighten the capscrews to the proper torque. *Note: Make sure you install the motor with the belly of it down and the case drain port up.* Install the counterbalance block. Hook up the brake line to the top of the brake housing (16). Fill the brake and gearbox with the proper oil.

TROUBLE SHOOTING

1. **PROBLEM:**
   Winch won't hold load.
   SOLUTION:
   a. Excessive back pressure in the system. Check the system for restrictions and reduce the backpressure.
   b. Brake discs are worn out. Replace brake discs.
   c. Winch clutch is slipping. Inspect the clutch and driver for wear and replace worn parts.
2. **PROBLEM:**
   Winch will not raise the load it should.
   SOLUTION:
   a. Relief valve setting may be too low to allow proper lifting. Increase relief valve pressure setting. *(Note: do not exceed recommended system pressures).*
   b. Load being lifted may be more than the winch's rating. Reduce the load or re-rig to increase mechanical advantage.
3. **PROBLEM:**
   Oil leaks from the vent on the motor side of the winch.
   SOLUTION:
   a. The motor shaft seal may have failed. Replace this seal and reduce backpressure if that caused the shaft seal to fail.
   b. Brake piston seals may have failed. Service the brake section and replace worn parts.

RUFNEK 60 BILL OF MATERIAL, A & B

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1B	43065	1	PISTON COVER
2B	42908	1	SPRING
3A	43180	1	COVER
3B	43055	1	PISTON HOUSING
4B	42910	1	PISTON
5B	43067	1	SHIFT PLATE
6A	43179	1	SUNGEAR
6B	42998	1	SUNGEAR
7	42999	1	SECONDARY SUNGEAR
8	42996	1	OUTPUT SUNGEAR
9	43031	1	PRIMARY GEAR HOUSING
10	43056	1	GEAR HOUSING
11	43059	1	DRUM
12	43071	1	COUPLER
13	43521	1	SLIDING CLUTCH
14	43062	1	CLUTCH
15	43398	1	CLUTCH PLATE
16	43058	1	BRAKE HOUSING
17	43577	1	AIR CYLINDER
18	43419	1	BRAKE COVER
19	43032	2	BUSHING
20	42976	1	OUTPUT SHAFT
21A	43161	1	INPUT SHAFT
21B	42977	1	INPUT SHAFT
22A	4249	1	INPUT GEAR SET
22B	4237	1	INPUT GEAR SET
23	4235	1	SECONDARY GEAR SET
24	4236	1	OUTPUT GEAR SET
25B	30205	4	CAPSCREW
26B	42232	2	O-RING
27	43068	1	BEARING
28B	32743	1	O-RING
29B	41903	3	RETAINING RING
30	20524	10	CAPSCREW
31	31582	1	O-RING PLUG
32B	41307	1	O-RING PLUG
33	43120	1	O-RING
34	41722	2	THRUST WASHER
35	28060	12	CAPSCREW
36	42841	1	O-RING
38	43066	1	THRUST WASHER
39	42978	1	O-RING PLUG, SPECIAL
40	43033	2	BUSHING
41	43057	2	OIL SEAL
42	20517	2	PIN MODEL 10/80
43	21163	1	U-BOLT
45	20886	6	CAPSCREW
46	43522	1	THRUST COLLAR
47	43070	3	KEY
49	43073	1	OIL SEAL
50	26340	1	BALL BEARING
51	42941	8	CAPSCREW

52	42148	8	STATOR PLATE
53	32765	7	FRICTION DISC
54	42942	1	BRAKE PISTON
55	42335	1	O-RING
56	42336	1	BACKUP RING
57	32186	1	O-RING
58	42337	1	BACKUP RING
59	42230	12	BRAKE SPRING
61	33094	1	O-RING
62	34003	1	O-RING
63A	43165	1	HYDRAULIC MOTOR, 2SPD.
63B	43162	1	HYDRAULIC MOTOR, 1SPD.
64	43072	1	INPUT DRIVER
66	26980	2	RING, RETAINING
67	41723	2	RACE
68	41743	2	BUSHING
69	42947	1	BRAKE DRIVER
70	30203	8	CAPSCREW
71	20318	8	NUT
72	20559	8	LOCK WASHER
73	43076	1	L.H. FRAME
74	43077	1	R.H. FRAME
75B	42949	1	THRUST WASHER
76	42929	1	BRAKE AIR CYLINDER
77	4238	1	BRAKE BAND ASSY.
79	42029	1	BLOCK, C.B.
80B	42030	1	HOSE ASSY.
81B	42259	1	LONG MALE ELBOW
82	42438	2	FITTING TEE
83	41838	2	STRAIGHT ADAPTER
84	42089	3	ELBOW
85	20521	4	NUT
86	20518	2	LOCKWASHER
87A	32182	2	O-RING
87B	32182	1	O-RING
88B	42211	1	SAE BLOCK
89	40546	4	CAPSCREW
90	42955	1	MOUNTING BRACKET
91	20525	2	CAPSCREW
92A	42031	2	HOSE ASSY
92B	42032	2	HOSE ASSY
93	13050	2	BREATHER
94	21684	2	PIPE PLUG
95	41759	1	CLUTCH
96	42970	1	AIR CYL. COVER, L.H.
97	42971	1	AIR CYL. COVER, R.H.
98	42979	1	AIR SHIFT KIT
99	43050	2	ADJUSTING NUT
100	42987	1	DRUM BRAKE LABEL
101	42986	1	CLUTCH OUT LABEL
102	42985	1	CLUTCH IN LABEL
103	43078	8	ROLL PIN
104	939243	1	CLEVIS PIN
105	20514	1	COTTER PIN
108B	43085	1	SPACER
109A	42495	1	HOSE

110	43372	4	CAPSCREW
111	42997	1	SUN GEAR
112	42030	1	HOSE
113	41719	1	PLUG
114	41867	1	COUNTERBALANCE VALVE
115	32411	1	PLUG
115B	42225	1	PLUG
116	42223	1	CHECK VALVE
117	42263	4	CAPSCREW
118	43367	1	SWITCH
119	43368	1	MANIFOLD BLOCK
121	42033	1	SWIVEL TEE
122	40280	1	STRAIGHT ADAPTER
123	43459	1	HOSE
124	42866	1	ZERK, GREASE
125	43578	1	AIR CYL. W/SWITCH
127	43289	1	SPACER, INPUT
128	43257	1	RING, THRUST
129	31550	1	SCREW, FLAT
130	20515	2	SET SCREW
131	43697	1	THRUST COLLAR
132	21128	2	ZERK, GREASE
133	4386	1	KIT, CLUTCH, SPRAG, RN60
134	44336	1	HOUSING, BEARING, RN60
135	44324	1	BEARING, NEEDLE
136	44325	1	RING, RETAINING
137	44323	2	RING, RETAINING
138	29162	2	BEARING, BALL
139	44334	1	DRIVER, INPUT, RN60
140	44335	1	DRIVER, BRAKE, RN60-130

RUFNEK 100 BILL OF MATERIAL, A & B

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1B	42907	1	PISTON COVER
2B	42908	1	SPRING
3A	43185	1	COVER
3B	42909	1	PISTON HOUSING
4B	42910	1	PISTON
5B	42911	1	SHIFT PLATE
6A	43125	1	SUNGEAR
6B	42912	1	SUNGEAR
7	42913	1	SECONDARY SUNGEAR
8	42914	1	OUTPUT SUNGEAR
9	42915	1	PRIMARY GEAR HOUSING
10	42916	1	GEAR HOUSING
11	42917	1	DRUM
12	42918	1	COUPLER
13	43506	1	SLIDING CLUTCH
14	43504	1	CLUTCH
15	43503	1	CLUTCH PLATE
16	42922	1	BRAKE HOUSING
17	43577	1	AIR CYLINDER
18	43419	1	BRAKE COVER
19	42868	2	BUSHING
20	42869	1	OUTPUT SHAFT
21A	43123	1	INPUT SHAFT
21B	42870	1	INPUT SHAFT
22A	4250	1	INPUT GEAR SET
22B	4228	1	INPUT GEAR SET
23	4229	1	SECONDARY GEAR SET
24	4230	1	OUTPUT GEAR SET
25B	30205	6	CAPSCREW
26B	42232	2	O-RING
27	42931	1	BEARING
28B	32743	1	O-RING
29B	41903	3	RETAINING RING
30	20524	12	CAPSCREW
31	41719	2	O-RING PLUG
32	41307	1	O-RING PLUG
33	28947	1	O-RING
34	42934	2	THRUST WASHER
35	28212	8	CAPSCREW
36	32368	1	O-RING
37	42935	1	THRUST WASHER
38	42936	1	THRUST WASHER
39	42978	1	O-RING PLUG, SPECIAL
40	42930	2	BUSHING
41	42928	2	OIL SEAL
42	20517	2	PIN MODEL 10/80
43	42937	1	U-BOLT
45	21644	6	CAPSCREW
46	42938	1	THRUST COLLAR
47	42939	3	KEY
49	42948	1	OIL SEAL
50	42932	1	BEARING

51	42941	8	CAPSCREW
52	42148	8	STATOR PLATE
53	32765	7	FRICTION DISC
54	42942	1	BRAKE PISTON
55	42335	1	O-RING
56	42336	1	BACKUP RING
57	32186	1	O-RING
58	42337	1	BACKUP RING
59	42230	12	BRAKE SPRING
60	28060	4	CAPSCREW
61	33094	1	O-RING
62	34003	1	O-RING
63A	43153	1	HYDRAULIC MOTOR, 2SPD.
63B	42953	1	HYDRAULIC MOTOR, 1SPD.
64	42944	1	INPUT DRIVER
65	29043	1	RETAINING RING
66	26980	2	RETAINING RING
67	41723	2	RACE
68	41743	2	BUSHING
69	42947	1	BRAKE DRIVER
70	20650	8	CAPSCREW
71	20653	8	NUT
72	20652	8	LOCK WASHER
73	42946	1	L.H. FRAME
74	42945	1	R.H. FRAME
75B	42949	1	THRUST WASHER
76	42929	1	BRAKE AIR CYLINDER
77	4231	1	BRAKE BAND ASSY.
79	42029	1	C.B. BLOCK
80B	42495	1	HOSE ASSY.
81	42259	1	LONG MALE ELBOW
82	42438	2	FITTING TEE
83	41838	2	STRAIGHT ADAPTER
84	42089	3	ELBOW
85	20521	2	NUT
86	20518	2	LOCKWASHER
87A	32182	2	O-RING
87B	32182	1	O-RING
88B	42211	1	SAE BLOCK
89B	29421	1	CAPSCREW
90	42955	1	MOUNTING BRACKET
91	29472	2	CAPSCREW
92A	42031	2	HOSE ASSY
92B	42032	1	HOSE ASSY
93	13050	2	BREATHER
94	21684	1	PIPE PLUG
95	41759	1	CLUTCH
96	42970	1	AIR CYL. COVER, L.H.
97	42971	1	AIR CYL. COVER, R.H.
98	42979	1	AIR SHIFT KIT
99	43050	2	ADJUSTING NUT
100	42987	1	DRUM BRAKE LABEL
101	42986	1	CLUTCH OUT LABEL
102	42985	1	CLUTCH IN LABEL
103	43078	8	ROLL PIN
104	939243	1	CLEVIS PIN

105	20514	1	COTTER PIN
108B	43085	1	SPACER
109	42495	1	HOSE
110	43372	4	CAPSCREW
112	42030	1	HOSE ASS'Y
113	41719	1	PLUG
114	41867	1	VALVE, C.B.
115A	32411	1	PLUG
115B	42225	1	PLUG
116	42223	1	CHECK VALVE
117	42263	4	CAPSCREW
118	43367	1	SWITCH, SOLONOID
119	43368	1	BLOCK, MANIFOLD
121	42033	1	TEE, SWIVEL
122	40280	1	ADAPTER, STRAIGHT
123	43459	1	HOSE ASS'Y
124	42866	1	GREASE ZERK
125	43578	1	AIR CYL. W/SWITCH
127	43288	1	SPACER
128	43505	1	RING, THRUST
129	31550	6	CAPSCREW, F.H.
130	20515	2	SET SCREW
131	43696	1	THRUST COLLAR
132	21128	2	GREASE ZERK
133	44338	1	HOUSING, BEARING, RN100
134	42932	1	BEARING, BALL
135	44323	2	RING, RETAINING
136	29162	2	BEARING, BALL
137	29043	1	RING, RETAINING
138	44337	1	DRIVER, INPUT
139	44335	1	DRIVER, BRAKE
141	4387	1	KIT, CLUTCH, SPRAG, RN100

RUFNEK 60 SUB-ASSEMBLY BILL OF MATERIAL

(81574 item 24) A and B
SA-4236

ITEM	DESCRIPTION	QTY.	PART NO.
1	OUTPUT CARRIER	1	43012
2	OUTPUT PLANET GEAR	3	43015
3	PLANET PIN	3	41747
4	RETAINING RING	3	41716
5	PLATE	1	43701
6	BEARING	6	41717
7	SPACER	3	41739
8	RACE	6	939249
9	SNAP RING	1	27011

(81574 item 23) A and B
SA-4235

ITEM	DESCRIPTION	QTY.	PART NO.
1	SECONDARY CARRIER	1	43013
2	SECONDARY PLANET GEAR	3	43014
3	BEARING	6	30484
4	RETAINING RING	3	41715
5	PLANET PIN	3	42184
6	RACE	6	28771
7	PLATE	1	43181

(81574 item 22) A and B
SA-4249

ITEM	DESCRIPTION	QTY.	PART NO.
1	INPUT CARRIER	1	43016
2	INPUT PLANET GEAR	3	42304
3A	PLANET PIN	3	41760
3B	PLANET PIN	3	42950
4	RETAINING RING	3	41715
5	BEARING	3	30484
6	RACE	6	28771
7	PLATE	1	43181

RUFNEK 100 SUB-ASSEMBLY BILL OF MATERIAL

(81575 item 22) A
SA-4250

ITEM	DESCRIPTION	QTY.	PART
1	INPUT CARRIER	1	43183
2	INPUT PLANET GEAR	3	42877
3	NEEDLE BEARING	3	30484
4	RETAINING RING	3	41715
5	PLANET PIN	3	41760
6	THRUST WASHER	6	40264
7	PLATE	1	42954

(81575 item 22) B
SA-4228

ITEM	DESCRIPTION	QTY.	PART
1	INPUT CARRIER	1	42925
2	INPUT PLANET GEAR	3	42877
3	NEEDLE BEARING	3	30484
4	RETAINING RING	3	41715
5	PLANET PIN	3	42950
6	THRUST WASHER	6	40264
7	PLATE	1	42954

(81575 item 23) A and B
SA-4229

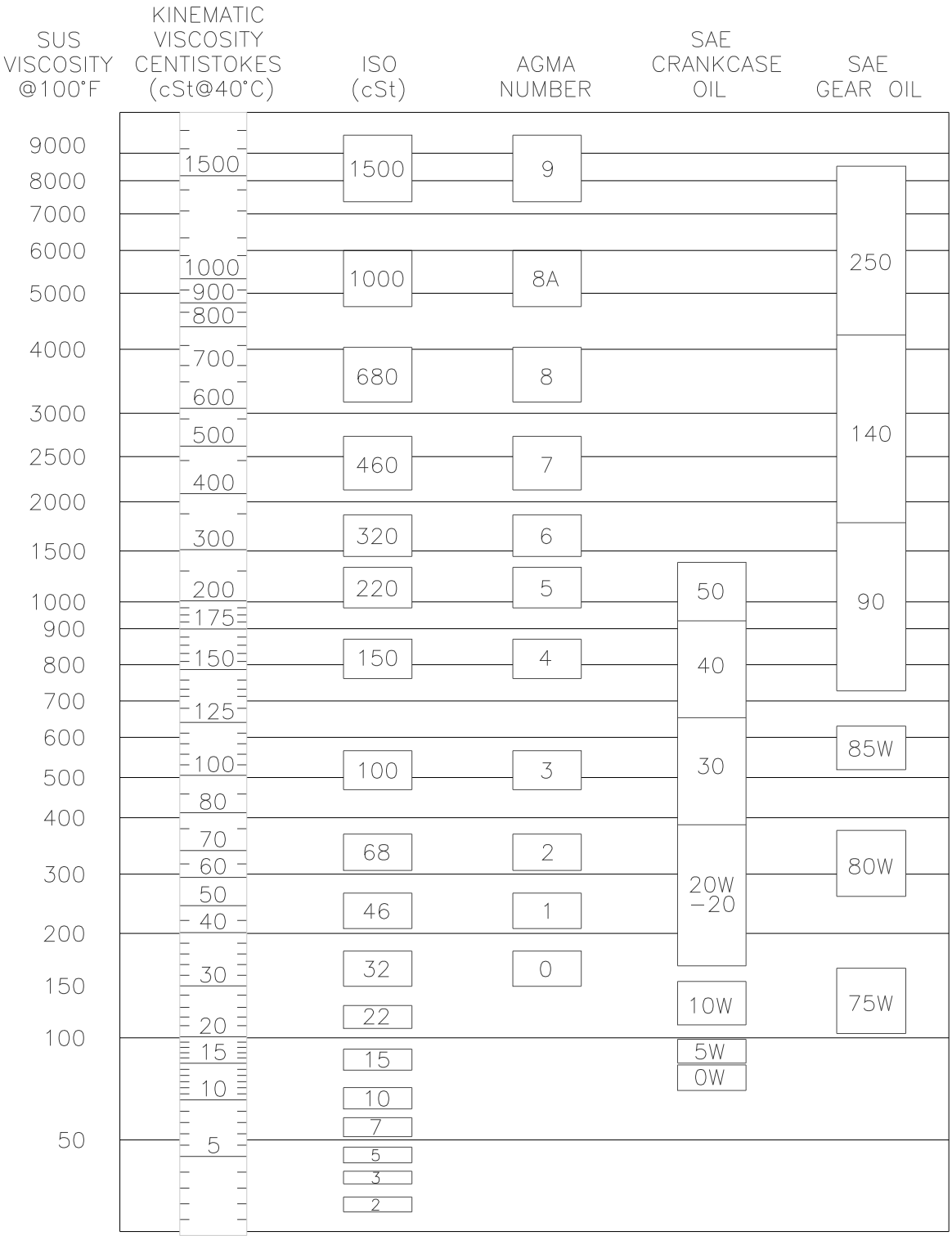
ITEM	DESCRIPTION	QTY.	PART
1	SECONDARY CARRIER	1	42926
2	SECONDARY PLANET GEAR	3	42876
3	BEARING	6	41717
4	RETAINING RING	3	41716
5	PLANET PIN	3	42951
6	RACE	6	939249
7	PLATE	1	42957

(81575 item 24) A and B
SA-4230

ITEM	DESCRIPTION	QTY.	PART
1	OUTPUT CARRIER	1	42927
2	OUTPUT PLANET GEAR	3	42878
3	NEEDLE BEARING	9	939247
4	RETAINING RING	3	41901
5	PLANET PIN	3	42952
6	RACE	6	27219
7	PLATE	1	42957
8	SNAP RING	1	43699

Tulsa Winch

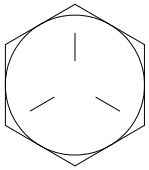
VISCOSITY CHART



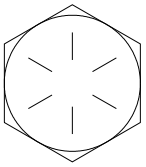
Tulsa Winch

TORQUE SPECIFICATIONS CHART

(HEX HEAD CAP SCREWS)



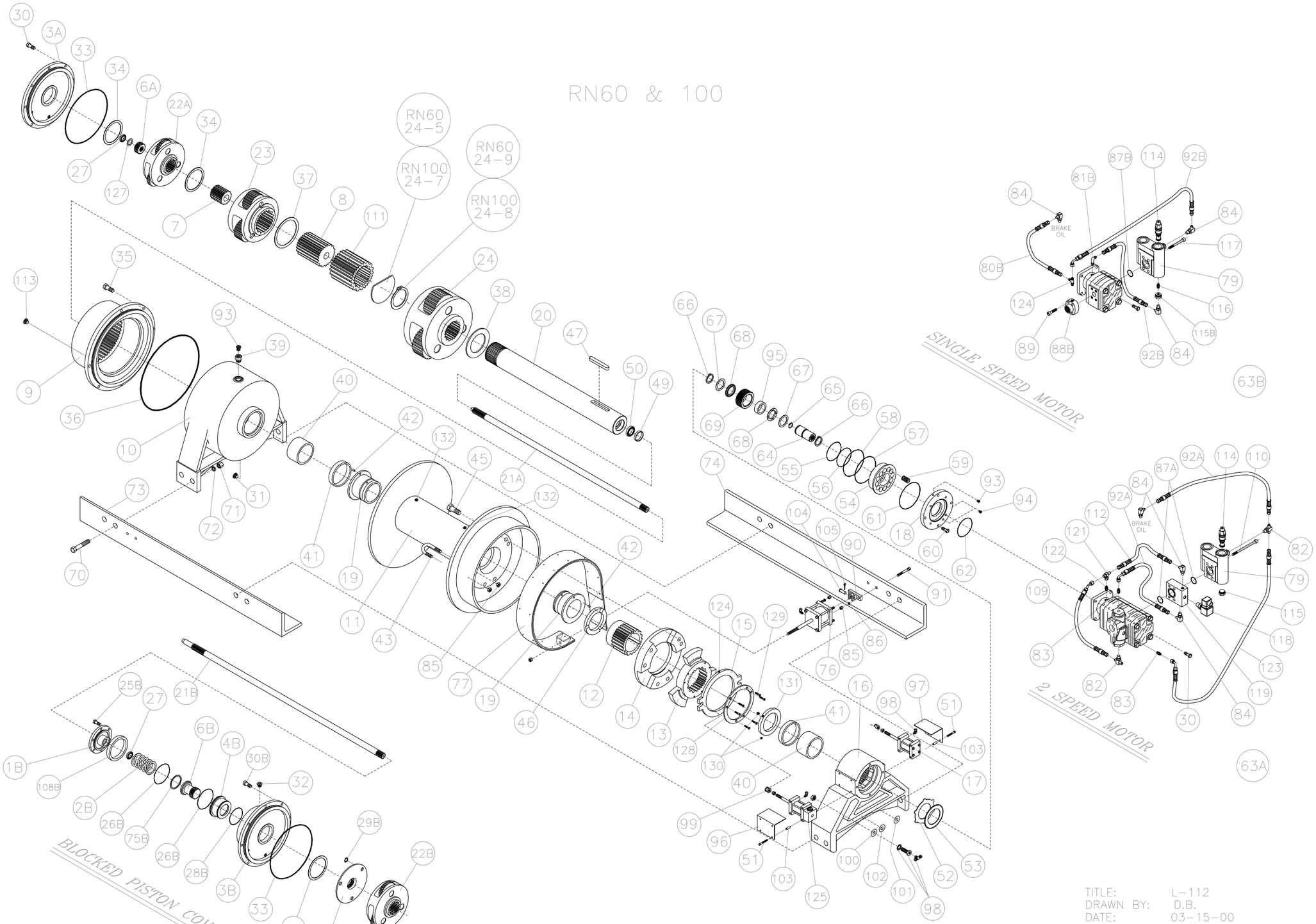
Grade 5



Grade 8

Nominal Dia.	Threads Per Inch	Ft. Lbs.	Ft. Lbs.
3/8	16 24	36 - 42 41 - 47	42 - 48 48 - 54
7/16	14 20	54 - 62 65 - 73	63 - 71 76 - 84
1/2	13 20	80 - 90 100 - 110	100 - 110 120 - 130
9/16	12 18	105 - 115 125 - 135	125 - 135 150 - 160
5/8	11 18	170 - 180 195 - 205	200 - 210 230 - 240
3/4	10 16	285 - 295 340 - 350	330 - 340 400 - 410
7/8	9 14	495 - 505 580 - 595	580 - 595 685 - 700
1	8 14	685 - 700 825 - 840	805 - 820 965 - 980
1-1/8	7 12	1045 - 1060 1240 - 1260	1500 - 1525 1680 – 1705

RN60 & 100



TITLE: L-112
DRAWN BY: D.B.
DATE: 03-15-00